

## CLAIMS

WE CLAIM:

1. A tire pressure holding system for a vehicle having at  
5 least a wheel and a tire mounted around the wheel, the tire having  
an interior, the system comprising:

a pump provided in a center of the wheel for discharging  
compressed air in synchronization with revolution of the wheel,  
the pump including a discharge section from which the compressed  
10 air is discharged;

a conduit connected to the interior of the tire and the  
discharge section of the pump;

a check valve provided in the conduit for preventing the  
air in the interior of the tire from flowing to the pump side;  
15 and

a release valve provided in the conduit for releasing the  
compressed air from the pump outside when an internal pressure  
is at or above a predetermined value in a section of the interior  
of the conduit between the check valve and the pump.

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2. A system according to claim 1, wherein the vehicle comprises  
a body and an axle fixed to the body, and the pump includes a  
rotary block fixed to the wheel and a driving mechanism connected  
between the axle of the vehicle and the rotary block, and the  
25 driving mechanism is actuated by relative rotation between the  
axle and the rotary block, thereby producing compressed air.

3. A system according to claim 1, wherein the vehicle comprises

a body and an axle fixed to the body, and the pump includes a rotary block fixed to the wheel and a coherent mechanism which is actuated by relative rotation between the axle and the rotary block thereby to produce compressed air.

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4. A system according to claim 1, wherein the vehicle comprises a body and an axle fixed to the body, and the pump includes a rotary block fixed to the wheel and a slider crank mechanism which includes a slider and is actuated by relative rotation between  
10 the axle and the rotary block, and the rotary block includes a cylinder in which the slider of the slider crank mechanism is directly moved thereby to serve as a piston so that compressed air is produced.

15 5. A system according to claim 1, wherein the check valve and the release valve are linked with each other so that when either one of the check valve and the release valve is opened, the other is closed.

20 6. A system according to claim 2, wherein the check valve and the release valve are linked with each other so that when either one of the check valve and the release valve is opened, the other is closed.

25 7. A system according to claim 3, wherein the check valve and the release valve are linked with each other so that when either one of the check valve and the release valve is opened, the other is closed.

8. A system according to claim 4, wherein the check valve and the release valve are linked with each other so that when either one of the check valve and the release valve is opened,  
5 the other is closed.

9. A system according to claim 1, wherein the conduit includes an outlet of the compressed air formed in the pump, a stem fixed to an outer circumferential edge of the wheel and having a space  
10 capable of communicating with the interior of the tire, and a pipe connecting each of the outlet and the stem to the other, and the check valve is fixed to the stem thereby to serve as a tire valve unit.

15 10. A system according to claim 2, wherein the conduit includes an outlet of the compressed air formed in the pump, a stem fixed to an outer circumferential edge of the wheel and having a space capable of communicating with the interior of the tire, and a pipe connecting each of the outlet and the stem to the other,  
20 and the check valve is fixed to the stem thereby to serve as a tire valve unit.

11. A system according to claim 3, wherein the conduit includes an outlet of the compressed air formed in the pump, a stem fixed  
25 to an outer circumferential edge of the wheel and having a space capable of communicating with the interior of the tire, and a pipe connecting each of the outlet and the stem to the other, and the check valve is fixed to the stem thereby to serve as a

tire valve unit.

12. A system according to claim 4, wherein the conduit includes an outlet of the compressed air formed in the pump, a stem fixed to an outer circumferential edge of the wheel and having a space  
5 capable of communicating with the interior of the tire, and a pipe connecting each of the outlet and the stem to the other, and the check valve is fixed to the stem thereby to serve as a tire valve unit.

10 13. A system according to claim 5, wherein the conduit includes an outlet of the compressed air formed in the pump, a stem fixed to an outer circumferential edge of the wheel and having a space capable of communicating with the interior of the tire, and a pipe connecting each of the outlet and the stem to the other,  
15 and the check valve is fixed to the stem thereby to serve as a tire valve unit.

14. A system according to claim 6, wherein the conduit includes an outlet of the compressed air formed in the pump, a stem fixed  
20 to an outer circumferential edge of the wheel and having a space capable of communicating with the interior of the tire, and a pipe connecting each of the outlet and the stem to the other, and the check valve is fixed to the stem thereby to serve as a tire valve unit.

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15. A system according to claim 7, wherein the conduit includes an outlet of the compressed air formed in the pump, a stem fixed to an outer circumferential edge of the wheel and having a space

capable of communicating with the interior of the tire, and a pipe connecting each of the outlet and the stem to the other, and the check valve is fixed to the stem thereby to serve as a tire valve unit.

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16. A system according to claim 8, wherein the conduit includes an outlet of the compressed air formed in the pump, a stem fixed to an outer circumferential edge of the wheel and having a space capable of communicating with the interior of the tire, and a  
10 pipe connecting each of the outlet and the stem to the other, and the check valve is fixed to the stem thereby to serve as a tire valve unit.

17. A system according to claim 1, wherein the release valve  
15 is fixed to the pump.

18. A system according to claim 9, wherein the release valve is fixed to the tire valve unit.

20 19. A system according to claim 18, wherein the check valve includes a valve core further including a cylindrical member having an open end, a shaft extending through the cylindrical member and having an end, a check valve lid fixed to the end of the shaft and a check valve urger which urges the lid so that  
25 the end of the cylindrical member is closed, the valve core being accommodated in the stem with the check valve lid being disposed at the tire side, and the release valve includes a communicating passage providing communication between the interior of the

conduit and the outside, a release valve lid direct moved between a first position where the communicating passage is closed by the lid and a second position where the communicating passage is opened by the lid, and a release valve urger which urges the  
5 release valve lid toward the first position, and the check valve and the release valve are associated with each other so that when either one of the check valve and the release valve is opened, the other is closed.

10 20. A system according to claim 18, further comprising an intermediate valve provided between the release valve and the check valve in the conduit, wherein the intermediate valve includes a shaft direct moved in the conduit, a generally disc-shaped sealing member fitted with an outer circumferential  
15 face of the shaft and having an outer edge curved so as to be pushed out toward the check valve, the sealing member being adhered closely to a circumferential face of the conduit, and a limiting plate placed on the sealing member and limiting elastic deformation of the sealing member in the direction opposite to  
20 the check valve and allowing the sealing member to elastically deform toward the check valve.

21. A system according to claim 20, wherein the intermediate valve is moved toward the check valve when the sealing member  
25 is subjected to the compressed air from the pump, thereby pressing the check valve so as to open the check valve.

22. A system according to claim 20, wherein the conduit

includes an external pump mount communicating with a space between the release valve and the check valve, the system further comprising an external pump discrete from the vehicle and detachably attached to the external pump mount.

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23. A tired wheel comprising a tire pressure holding system for a vehicle having at least a wheel and a tire mounted around the wheel, the tire having an interior, the system comprising:

a pump provided in a center of the wheel for discharging  
10 compressed air in synchronization with rotation of the wheel,  
the pump including a discharge section from which the compressed  
air is discharged;

a conduit connecting between the interior of the tire and  
the discharge section of the pump;

15 a check valve provided in the conduit for preventing the  
air in the interior of the tire from flowing to the pump side;  
and

a release valve provided in the conduit for releasing the  
compressed air from the pump into an outside when an internal  
20 pressure is at or above a predetermined value in a section of  
the interior of the conduit between the check valve and the pump.

24. A vehicle comprising a tire pressure holding system for  
a vehicle having at least a wheel and a tire mounted around the  
25 wheel, the tire having an interior, the system comprising:

a pump provided in a center of the wheel for discharging  
compressed air in synchronization with revolution of the wheel,  
the pump including a discharge section from which the compressed

air is discharged;

a conduit connecting between the interior of the tire and the discharge section of the pump;

a check valve provided in the conduit for preventing the  
5 air in the interior of the tire from flowing to the pump side;  
and

a release valve provided in the conduit for releasing the compressed air from the pump into an outside when an internal pressure is at or above a predetermined value in a section of  
10 the interior of the conduit between the check valve and the pump.

25. A tire valve unit fixed to an outer edge of a wheel having a tire fitted around the wheel, the unit comprising;

a stem having a space capable of communicating with the  
15 interior of the tire;

a check valve fixed in the stem and being capable of supplying air into the tire, the check valve further preventing the air in the tire from leaking outside;

a pump connector provided in a central portion of the wheel  
20 and connected via a pipe to the pump discharging compressed air in synchronization with revolution of the wheel, so that the compressed air is introduced into the stem; and

a release valve releasing the compressed air from the pump into an outside when an internal pressure is at or above a  
25 predetermined value in a section of the interior of the stem nearer to the pump than the check valve.

26. A tire valve unit according to claim 25; wherein the



check valve and the release valve are linked with each other so that when either one of the check valve and the release valve is opened, the other is closed.

5        27. A tire valve unit according to claim 26, wherein the check valve includes a valve core further including a cylindrical member having an open end, a shaft extending through the cylindrical member and having an end, a check valve lid fixed to the end of the shaft and a check valve urger which urges the  
10 lid so that the end of the cylindrical member is closed, the valve core being accommodated in the stem with the check valve lid being disposed at the tire side, and the release valve includes a communicating passage providing communication between the interior of the conduit and the outside, a release valve lid direct  
15 moved between a first position where the communicating passage is closed by the lid and a second position where the communicating passage is opened by the lid, and a release valve urger which urges the release valve lid toward the first position, and the check valve and the release valve are associated with each other  
20 so that when either one of the check valve and the release valve is opened, the other is closed.

28. A tire valve unit according to claim 25, further comprising an intermediate valve provided between the release valve and the  
25 check valve in the conduit, wherein the intermediate valve includes a shaft direct moved in the conduit, a generally disc-shaped sealing member fitted with an outer circumferential face of the shaft and having an outer edge curved so as to be

pushed out toward the check valve, the sealing member being adhered closely to a circumferential face of the conduit, and a limiting plate placed on the sealing member and limiting elastic deformation of the sealing member in the direction opposite to  
5 the check valve and allowing the sealing member to elastically deform toward the check valve.

29. A tire valve unit according to claim 28, wherein the intermediate valve is moved toward the check valve when the sealing  
10 member is subjected to the compressed air from the pump, thereby pressing the check valve so as to open the check valve.

30. A tire valve unit according to claim 25, wherein the conduit includes an external pump mount communicating with a space  
15 between the release valve and the check valve, the system further comprising an external pump discrete from the vehicle and detachably attached to the external pump mount.